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# HAY CAPS

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**H**AY CAPS can be used to advantage to keep rain from wetting hay in cocks on many farms in the eastern half of the United States. In the corn belt, where thousands of farmers are growing small acreages of alfalfa and beginning to realize the great value of this crop, the use of hay caps would largely obviate the difficulty now experienced in curing first and last cuttings. The old methods used in curing mixed timothy-and-clover hay are not always adequate for alfalfa, and in many instances a good grade of alfalfa hay might be assured by the use of hay caps.

In the South, where the weather is rainy a large part of the time during the long haying season, the hay cap is an especially valuable addition to haymaking equipment. Alfalfa and alfalfa and Johnson grass mixed hay are cut from three to five times a year in the South, and a great deal of hay of inferior quality is made as a result of trying to cure by ordinary methods. In this section hay caps have been used to great advantage, especially with legume hay grown for the market.

Contribution from the Office of Farm Management and  
Farm Economics

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# HAY CAPS.

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## WHY HAY CAP USERS ARE ENTHUSIASTIC.

**H**AY GROWERS east of the Mississippi River who use hay caps are nearly always very enthusiastic regarding the advantages of this method of curing hay. The caps protect the hay cocks from rain, reduce the loss of leaves, and improve the color and increase the feeding value of the hay.

## KINDS OF HAY CAPS.

Hay caps are of two distinct types, those that are entirely impervious to both air and rain, and those that shed nearly all of the rain, and at the same time allow more or less of the moisture-laden air from the interior of the cock to pass through and be carried away.

## WATERPROOF CAPS.

Waterproof caps are of two kinds, those made of wood pulp and those made of cloth treated so as to make it waterproof.

The wood pulp cap prevents rain from entering the cock, though it also prevents ventilation of the interior of the cock. Caps of this type, therefore, are undesirable for use on hay cocked when very "green," especially if the ground is saturated and the weather likely to continue damp and rainy. Under such conditions hay under wood-pulp caps may be damaged greatly by heating. Wood-pulp caps can be used advantageously when the hay is almost cured before being cocked, especially if it is desired to allow the cock to stand several days.

Canvas or duck caps are waterproofed by treating the material with oil paraffin, gelatine and chrome alum, soap and iron sulphate, or other materials that can be used to fill up the interstices in the fabric. Cloth waterproof caps give about the same results as wood-pulp caps. Being lighter and less cumbersome to handle than the latter, they are often preferred when waterproof caps are required.

## UNTREATED CLOTH CAPS.

Ordinary cloth caps are made of sheeting, unbleached muslin, twilled cotton, and different weights of duck and canvas, in sizes varying from 24 inches square to 7 feet square, or even larger in a

few instances. Dissatisfaction with caps has sometimes been due to the use of caps too small to keep the cock dry. Caps 30 to 36 inches square seem to be preferred at present for the ordinary cock containing about 100 pounds of cured hay.

#### METHODS OF FASTENING.

Several methods of fastening caps on the cock are in use. Some caps are made with brass eyelets in each corner, and heavy wire pins, 12 inches long, are run through the eyelets into the hay to pin the cap firmly to the cock. (See title-page illustration.) This is a good way to fasten the cap, the only objection being that the wire pins are easily lost and are rather hard to see if dropped in stubble.

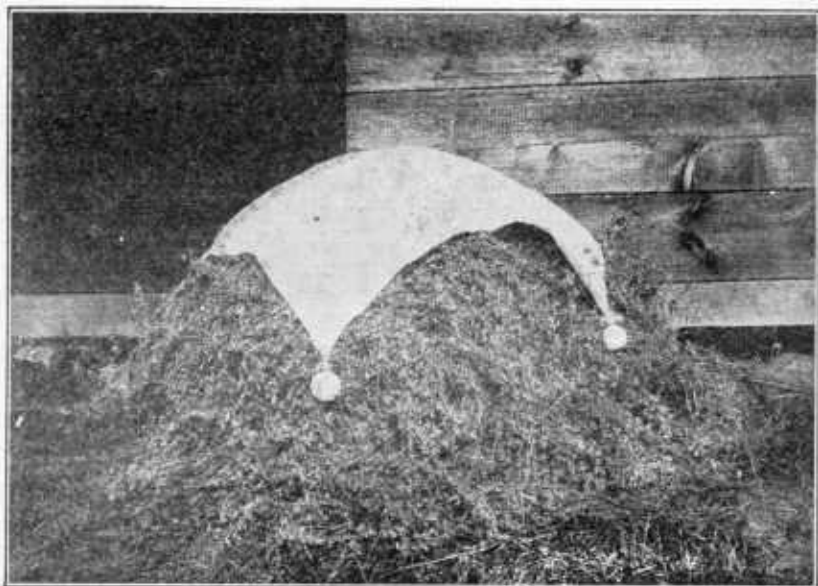


FIG. 1.—One very satisfactory method of fastening on a hay cap. A cement ball is fastened to each corner. The cap will always fit tightly over the hay and will not be blown off by an ordinary wind. There are no pins to get lost when handling the cap.

Caps are sometimes weighted by turning up the corners and sewing up in each a handful of clean sand. A better and more convenient method of making such a weight is to mold cement with the hand into balls, which are much easier to fasten than sand. (See fig. 1.) Half horseshoes and nuts from heavy bolts attached to each corner by a cord a foot or more in length are often used for weights. Such weights sometimes are tangled up when a lot of caps have been thrown into a wagon just as taken off the cocks, and considerable time is lost in untangling them.

• Another method of fastening caps is to use strings but no weights. A string about 30 inches long is tied to each corner of the cap and the ends of the strings are tied together so as to make two loops on

opposite sides of the cap. After the cap has been placed on the cock, a handful of hay, twisted like a strand of rope, is passed through each loop, the ends of each hay rope are brought together, each side of the cock is lifted up a little and the loops of hay are pushed under the edges of the cock so as to pull the cap strings tight. Two men working together can put on caps much more easily by this method than can one man. This method of fastening is much better for large, rather flat cocks, that do not settle much, than for tall narrow cocks that settle considerably.

Large caps (8 by 10 feet), used when hay is cured in bunches made by a push rake, are fastened on by means of baling wires, tied to the corners and run under the edges of the bunch of hay. This is a very successful and cheap way of fastening caps of this type.

#### HEAVY CAPS VS. LIGHT CAPS.

Opinions differ considerably regarding the proper weight of material for hay caps. Some think that wood pulp or heavy canvas<sup>1</sup> caps should be used, and others believe just as firmly that very light-weight caps,<sup>2</sup> such as caps made from A sheeting, twilled

<sup>1</sup> The following extracts are from a letter by W. T. Donaldson, a Mississippi hay grower:

"In reply to your letter inquiring about the use of hay caps, I would say that their value depends largely upon the climate and the kind of hay being saved. \* \* \* We must recognize the fact that to cover hay prevents the circulation of air to a large extent, thereby taking a longer time to cure the hay. \* \* \*

"I have used 8 by 10 foot caps to good advantage in covering hay on the ground. These caps were made of 8-ounce army duck. Waterproofing is quite a help, both in keeping the hay dry and in preserving the caps. These caps had eyelets at each corner and in the middle of the sides. A baling wire fastened to one corner of the cap and pushed under the pile of hay and fastened at oblong corner on other end is a successful and cheap way of fastening.

"The number of caps per acre will depend upon the yield of hay. With a sweep rake three or four hundred pounds of hay can be easily brought together so that two men can round it up easily and put caps on. A cap 8 by 10 feet (the long way to the wind) will cover a cock this size. If the yield is 1 ton per acre, six or seven caps will care for 1 acre of hay. \* \* \*

"One man with a sweep rake can push up as much as 8 or 10 men can round up and cap. I should think that 10 men could round up and cap 50 acres per day easily, though I have never worked at it all day. We have seldom had to cover more than 30 acres at a time.

"The life of the caps depends largely upon the care taken of them. After being used they should be spread out in the sun to dry and folded up and put where the mice will not have a chance to cut them. I think that in Mississippi, when we use them three or four times each year, four seasons would be as long as they would last in serviceable condition.

"They are a great help in saving hay in good condition as to soundness and color, especially alfalfa. I think that a man can add at least 20 per cent to the value of his crop in quantity and condition by using caps carefully. In this State, where most of the hay is baled from the windrow, they are especially serviceable. They require, however, much more work, and if the piles are left too long on the ground the plants under them are smothered to death.

"I should think that the caps would not be needed in saving timothy that is cut but once a year, or the clovers, but with alfalfa, which we cut five times, they are necessary."

<sup>2</sup> The following extracts from a letter by Thomas G. Scott, a Georgia hay grower, bear upon the use of light-weight hay caps:

"The writer has had in use on his farm, for the past 10 years, covers made of unbleached sheeting. Some of the first bought are still in use. They were first used for covering cocks of pea-vine hay, which requires a week or more to cure out thoroughly. Subsequently the same kind of covers were used for covering shocks of small grain. For both crops they are invaluable.

"This method of protecting either small grain or hay will preserve the crop absolutely except in cases of long wet spells, when there will be more or less injury from weathering. Even then, however, the crop will never be seriously injured where the grain or hay has been properly shocked or piled and the covers carefully put on.

"Covers for small grain should be not less than 30 or more than 36 inches square. From 10 to 16 bundles should be put to the shock (machine-tied bundles are referred to), and the caps tied onto the bands on the sheaves by means of strings in each corner

cotton, or unbleached muslin, are most satisfactory. The fact is that heavy caps are best under certain conditions, and light-weight caps are best under other conditions.

The heavier the material the more rain it will shed, but the heavy material costs a great deal more than the lighter material, and the heavier the material the poorer the ventilation and the slower the drying out and curing of the hay in the cock. Moreover, light-weight caps will turn much water during short rains if the top of the cock is well rounded off and the cap put on properly.

The heavier caps of canvas, wood pulp, or waterproofed paper board are no doubt better to use during continued spells of rainy weather if the hay is not too green when cocked, while the light-weight caps have proved satisfactory in sections where the rains are of short duration and occur only occasionally.

#### KINDS OF COTTON GOODS SUITABLE FOR HAY CAPS.

*Sheeting.*—The lightest and cheapest material used for hay caps is cotton sheeting. This material is known also under the names of factory cloth, "A" sheeting, domestic, bleached, half-bleached, and unbleached muslin. Sheetting varies from 36 to 120 inches in width. The kind commonly used for hay caps is the common unbleached sheetting weighing about 6 ounces per square yard.

*Drill.*—Drill, drilling, or twilled cotton, used for hay caps, is usually heavier than sheetting. Sheetting tends to absorb water, while drill sheds it more readily. This is due to the closer weave and diagonally ridged surface of the drill. It is usually made about 30 inches wide. The heaviest material used for hay caps weighs about 8 ounces per linear yard (30 inches wide), although 6 and 7 ounce material gives good satisfaction in many cases.

*Canvas.*—Canvas, or cotton duck, used for hay caps is usually a heavy, single-weave material. Double-weave or double-filled material is seldom used. The standard width for regular cotton duck, sail duck, is 22 inches. It varies in weight from 19 to 7 ounces per linear yard and is numbered from 0 to 12. Some misunderstanding may occur in ordering "ounce ducks" by weight. The terms "8-ounce," "10-ounce," etc., refer to the number of ounces per linear

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of the cover. In the manufacture of the covers it is better to have eyelets in each corner, although they may be made at home, and any method that is found convenient may be used for attaching the strings.

"Great care should be observed, in handling small grain, not to have the shocks too large, if the crop happens to be a little green.

"For saving hay the covers should be larger. In the experience of the writer, 36 inches square is the most economical size, all things considered. If the cocks of hay are properly put up, these caps will cover from 200 to 300 pounds of cured hay each. When finished, the cocks of hay should be cylindrical in shape, rather than conical, except that the last 12 or 18 inches of the top should be rounded off somewhat in the shape of an umbrella.

"If the work of shocking and piling the grain or hay is well done, and the covers carefully put on, it will be found that the crop will cure out better under untreated material than it will under waterproof fabric, because the moisture will escape more readily through plain cloth, and absolutely no water will leak through if the covers are put on so as to leave no depressions for the water to collect in."

yard and not per square yard. It is seldom that a duck heavier than 10 ounces is used for hay caps.<sup>1</sup>

### DURABILITY OF CAPS.

The life of a cap depends upon the kind of material, condition of cap when stored away, and especially the care it receives while not in use. The service rendered is so dependent upon these closely related factors that it is difficult, or almost impossible under average conditions, to base length of service on any one of these factors independent of the others.

Caps made from heavy material, such as canvas, will last longer than light-weight caps when both are used under the same conditions and receive the same degree of care. Heavy-weight caps are not easily torn as are the light-weight caps, and this fact tends to make the heavy cap last longer.

Caps that have been waterproofed differ in the service rendered, owing to differences in materials used in treating the cloth. Material that renders the cloth stiff makes the threads brittle and thereby shortens the life of the cap, while material that does not stiffen the cloth tends to lengthen the life of the cap beyond that of the stiff caps or caps made from untreated cloth.

Service rendered should not be reckoned in terms of years, however, but in total number of days actually used, for service reckoned by years used is often likely to be very misleading. For example, a northern hay grower sometimes uses a cap for eight years whereas a southern grower often gets only four years of service from the same kind of cap. This would lead to the impression that caps last longer in the North than in the South, when as a matter of fact the southern grower probably uses his caps several times more, in number of days actually used, than does the northern grower.

<sup>1</sup> In the manufacture of "regular" cotton duck, the established standard of weights of 22-inch sail duck is the basis of all calculations. This standard is as follows:

TWENTY-TWO INCH SAIL DUCK.

No.	Weight per linear yard.	No.	Weight per linear yard.
	<i>Ounces.</i>		<i>Ounces.</i>
0.....	19	7.....	12
1.....	18	8.....	11
2.....	17	9.....	10
3.....	16	10.....	9
4.....	15	11.....	8
5.....	14	12.....	7
6.....	13		

Other widths than 22 inches weigh in proportion to the above; that is, any width of No. 8 duck, for instance, should weigh the same per square inch as 22-inch No. 8.

"Ounce ducks" are 28½ to 30 inches wide and weigh 7 ounces, 8 ounces, 9 ounces, 10 ounces, 12 ounces, or 15 ounces per linear yard. Ounce ducks are made in a variety of ways, from cheaply constructed goods, with coarse, loosely twisted, single yarns, to the best grades of army duck, made with fine yarns, doubled and twisted, both warp and filling. This should be remembered, as an order for 8-, 10-, or 12-ounce duck, unless the particular brand or quality were specified, might not be filled as the buyer expected.



In the North enough hay caps are provided to cover an entire cutting at one time, and are used only once each year for clover or two or three times for alfalfa, while in the South caps are used at least twice per cutting for five cuttings when alfalfa is grown, or almost continuously for a period of four months. Therefore, those thinking of using caps should consider the number of days actually used, in estimating the probable life of caps.

#### COST.

At present, material for hay caps costs more than before the war, owing to the great demand by the Government for goods of this class. One large mail-order house quotes canvas caps at a price about three times that of the same caps three years ago.

The cost of caps has always been a factor that determined, to a great extent, the profitableness of curing in the cock under caps. Under some conditions there is no question about the saving effected by the use of caps, even though the cost of material is relatively high. Under other conditions there is doubt as to the necessity of using caps. Again, there are conditions when it is known positively that curing under caps is unprofitable.

Those who know definitely that the use of caps will prove profitable should remember that although caps are now costly, the market price of hay, especially of good hay, in many sections is considerably higher than it was two or three years ago. The increase in the price of market hay makes it possible to pay considerably more for hay caps than formerly and still realize a profit as great as or even greater than that derived when caps cost less.

In considering this matter, the farmer should figure the probable saving in dollars and cents to be effected by using caps when average haying weather prevails, since it is not disputed that caps will sometimes pay for themselves when used only once during a period of continued bad weather.

#### HOW HAY CAPS ARE USED.

The proper time to put on caps depends upon conditions. When the hay area is small the haying crew is necessarily small, and often all of the available hands work in the hay field, especially in the afternoon. Often the caps are not put on as soon as the hay is cocked, since to do so would take one or two men from the crew, which might interfere seriously with the arrangement of the work. If there are no indications of rain in the evening, putting on caps is sometimes postponed until the next forenoon. This is a risky practice in many sections, for rains often occur unexpectedly during the night. Failure to put on the caps promptly sometimes results in the hay being damaged rather seriously. The best plan is to arrange to

have the caps put on just as soon as the cock is made, and this is usually done on farms growing a large acreage of hay. (See fig. 2.)

One man and a boy, one horse and a light wagon are required for each 25 tons of hay per cutting, when the yield per cutting is about 1.75 tons per acre. In the forenoon the caps are taken off the cured hay that is ready to be hauled to the barn. This is done by the man. If caps with wire pins are used these are wrapped up in the cap. The man carries the caps along until 8 to 10 have been taken off, when he drops them, to be picked up by the boy, who follows with the one-horse wagon. After the desired number of cocks have been uncapped the wagon is driven among the freshly-made cocks and the caps are tossed out, to be put on by the man who follows the cap wagon.

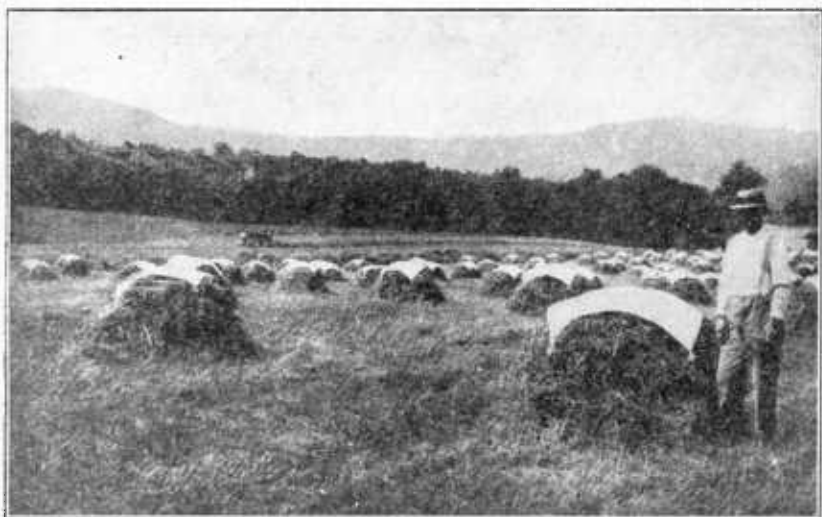


FIG. 2.—How hay caps are used by a successful alfalfa-hay maker. They are put on just as soon as the hay is cocked. Note mower in operation and near by it the hay which has been raked and is curing in the windrow until it is ready for cocking.

One man and one boy can take off and put on caps for about 15 acres, or 26 tons, of hay per day, working all day. They take no other part in haying operations.

Caps held on by weights can be handled a little more quickly than caps fastened with pins.

Large caps, 8 by 10 feet, are used by a few expert makers of mixed alfalfa and Johnson grass hay in the South. The curing is done in the bunch, made by using a push rake on hay in the windrow and rounding up with a pitchfork. The caps are used only when there are indications of rain. One haymaker, who uses the large caps, says that ordinarily it is necessary to cover about one-third of the hay at a time.

When hay is cured on trucks a canvas 9 by 14 feet is put on just as soon as the truck is loaded. The canvas remains on the truck until the hay is baled. If it is desired to use the truck as soon as possible, the hay can be baled from three to seven days from the time the truck is loaded, depending upon the weather. When cured hay is left on a truck for a considerable length of time it is customary to leave the canvas cover on to protect the hay from rain.<sup>1</sup>

### STORING.

It is very important that caps should be entirely dry when stored. When there is a rush of work, as is usually the case during haying season, caps are sometimes dumped in a pile on the barn floor, to be cared for later. If they are forgotten, as sometimes happens, and are the least bit damp, they will mildew and rot. It is much easier to dry caps before storing them than afterwards, but in case this can not be done they should be hung up so that the air will have a chance to dry them out quickly.

The ordinary cap, whether made of light material or of duck, if well cared for, should last several seasons when used on three to four cuttings per season. One southern grower has used unbleached sheeting caps that have lasted him 10 years. This long record of service is due largely to the excellent care he has given the caps when storing. The best grade of caps can be ruined in one year by mildew if not stored properly.

### REASONS FOR USING HAY CAPS.

#### HAY CAPS PROTECT HAY FROM RAIN.

Primarily, hay caps are used to protect partially cured hay from rain. Incidentally, there are several other reasons for using them.

Two important processes are involved in the curing of hay—the throwing off of a large per cent of the water in the plant, and a heating or sweating process that takes place when hay is put into the cock. The heating that occurs as hay is being properly cured does not damage it in the least. Indeed, it is possible that it develops aroma and palatability.

When rain wets hay in the cock, however, it stops the natural curing process and causes the hay to heat very rapidly. When this happens the hay often becomes so hot that its feeding value is lessened. Sometimes the heat is so intense that the hay is ruined. The use of caps, when put on hay that is cocked at the right stage, will prevent damage from wetting by rain.

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<sup>1</sup> Curing trucks are used in Mississippi, where the weather is very unfavorable for making hay. The truck consists of a hay rack, 7 by 12 feet, mounted on two low metal wheels. When hay is in condition to be cocked, about a ton is loaded on the truck and a large canvas cap is put on to protect it from the rain. Curing on trucks has one advantage over curing in the cock under caps in that there is no danger of damage from moisture in the ground, which sometimes damages hay in the bottom of the cock.

**HAY CAPS PREVENT LOSS OF COLOR.**

The quality or grade of hay is indicated, to a large extent, by its color. Color shows the stage at which the hay was cut and whether it has been affected by sun or rain, or has been properly cured. The hay that brings the highest price on the city market must have a good color. This is absolutely essential. The grower of market hay especially should realize the necessity of preventing loss of color in curing.

When hay caps are not used, one rain may wet the top of the cock to a depth of several inches and cause the hay to lose its natural green color and turn dark. The amount of this kind of hay in a cock may be only a forkful. If it shows on the outside, however, when put into a bale, the bale may be graded down. This small amount of "off-colored" hay in a bale may force it to sell at a lower price than is really warranted.

A few good hay makers in the South make a practice of "skinning" the tops of the cocks that have suffered a loss of color due to rain or sun. This is done by removing, very carefully, by hand, all of the discolored hay from the top of the cock. When this is done all of the hay that goes into the bale is practically of one grade. This practice is not general, because it takes a considerable amount of careful labor, and because there is no sale for the hay removed. So, the discolored hay is usually baled along with the good hay and lowers its grade.

Direct sunlight causes alfalfa hay to bleach and become lighter in color if the cocks remain in the field very long without caps.

In many sections the reduction in the value of the hay, through discoloration by sun and rain, in a normal season amounts to as much as, or, perhaps, more than the cost of enough hay caps to prevent this loss.

**HAY CAPS SAVE LEAVES AND GIVE A GREATER YIELD OF HAY PER ACRE.**

Legume hay, cured in the cock, yields more per acre than when cured in the windrow. This is due to the saving of a large percentage of the leaves by curing in the cock. Leaves<sup>1</sup> constitute from 40 to 60 per cent of the weight of alfalfa and about 30<sup>2</sup> per cent of cowpeas.

Unless alfalfa is handled very carefully a heavy loss of leaves may occur. It has been found<sup>3</sup> that "the minimum loss from the falling off of the leaves and stems in careful haymaking amounts to from 15 to 20 per cent; and, in cases where conditions have been unfavorable, as much as 60 or even 66 per cent of the entire crop has been lost."

When hay is cured in the windrow under unfavorable weather conditions a large loss of leaves usually occurs, especially when it becomes necessary to use the tedder, or to spread out the hay by

<sup>1</sup> Col. Agr. Expt. Sta. Bul. 110, 1906.

<sup>2</sup> Ala. Agr. Expt. Sta. Bul. 118, 1902.

<sup>3</sup> Kans. Agr. Expt. Sta. Bul. 114, 1902.

hand, or to turn the windrow over with a side-delivery rake to induce even curing. At that time the leaves and stems are very easily broken off when the hay is handled. A loss of leaves occurs also when uncapped cocks are spread out to dry.

Some successful haymakers put their hay into cocks when it is well wilted, at which time the danger of leaf loss is least, and cover the cock with a hay cap, thus avoiding the necessity of any handling until the hay is cured.

In experiments in New Jersey<sup>1</sup> it was found that when some of the cocks in an alfalfa field were covered with cotton sheeting caps 45 inches square, and exposed to a hard rain lasting 24 hours, the hay was damp only 2 or 3 inches below the cap. The cocks not covered with caps received a thorough wetting and the hay was more or less bleached, the stems brittle, and loss of leaves heavy.

#### HAY CAPS REDUCE LOSSES IN PALATABILITY.

Legume hays are especially susceptible to losses in aroma and palatability from rain damage. Loss of aroma is accompanied also by losses in the most soluble and digestible nutrients. In those regions therefore where heavy rains are frequent the curing of hay in cap-covered cocks will prevent serious losses in palatability. The capping of distinctly undercured hay, however, may cause a strong fermentation that will produce must or mold. Hay should be well wilted, at least, before it is put up in cap-covered cocks to sweat and cure.

Aroma is closely associated with palatability and feed value. Hay that has lost its fragrance because of weathering or overdrying, also loses a part of the most soluble and delicate forms of those nutrients that are known to be of great importance to feed value. Livestock will consume greater quantities of fragrant hay than of hay that has lost its aroma.

Palatability and aroma are influenced greatly by the method used in curing. An expert haymaker can make an excellent quality of hay by curing either in the swath, windrow, or bunch, if he has plenty of good labor and the proper haying implements, provided the weather is favorable for curing by one of these methods or a combination of them. During unfavorable weather, however, he usually succeeds in curing but a small portion of his hay into a good grade, the greater part being of only a fair feeding grade and the remainder of little feeding value.

Expert haymakers are very scarce, however, and the ordinary, less skillful haymaker, especially the beginner, often makes a failure in trying to make choice hay by ordinary methods during unfavorable weather.

Farmers making a specialty of producing choice hay for the market, or feeders, such as dairymen, desiring good palatable hay free from dust, will find that under certain conditions it will pay well to

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<sup>1</sup> N. J. Agr. Expt. Sta. Ann. Rpt. 1907.

cure hay in the cock, under hay caps, when ordinary methods have been found to be unsatisfactory.

#### WHEN HAY CAPS ARE NOT AN ADVANTAGE.

The most general reason why hay caps are not used more extensively in the States east of the Mississippi River is the belief of growers, both North and South, that they cost too much to warrant their use on a large scale. Other important reasons exist. Their use in the North would necessitate the adoption of an entirely different and more costly method of haying than the method in general use at present. In the South there is a long-standing belief that they prevent the moisture in hay from leaving the cock.

#### SPECIAL CONDITIONS IN THE NORTH.

The best method for curing depends largely upon the kind of hay. Grass hays, such as timothy, redbud, and prairie hays, cure out rather quickly because they have hollow stems and long thin leaves. Legume hays, such as alfalfa and the clovers, having solid "sappy" stems, and leaves amounting to about 50 per cent of the plant by weight, require a much longer time to cure than grass hays. In other words, the farmer has a much better chance of making a good quality of grass hay in unfavorable weather than of making a good quality of legume hay.

Curing in the North, as already stated, is nearly all done in the swath and windrow. There are two very good reasons for this practice. In 1910<sup>1</sup> the cultivated or "tame" hay crop in five leading hay States, namely, New York, Ohio, Indiana, Illinois, and Iowa, consisted of timothy alone 48 per cent, timothy and clover mixed 43 per cent, clover alone 8 per cent and alfalfa 1 per cent. Nineteenths (91 per cent) of the total annual production of "tame" hay in these States was composed of timothy or a mixture of timothy and clover. This kind of hay cures in a comparatively short time in ordinary haymaking weather, and therefore there is little necessity for curing in the cock under caps when the yield is not above the average, which is about 1.50 tons per acre. The second reason is that scarcity of farm labor has had a strong tendency to prevent the curing of clover hay under hay caps, even when this practice is known to give the best results. Inability to get sufficient labor has caused the hay grower to cure his hay by the method requiring the least amount of labor, namely, curing in the swath and windrow.

During the last 10 years, however, a gradual change has been taking place in the kind of hay grown in the timothy belt. The acreage devoted to alfalfa has increased very rapidly; in Iowa and Indiana in 1910 it was approximately 1 per cent of the tame hay acreage. In

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<sup>1</sup> From Thirteenth Census Report, 1910.

five years (from 1910 to 1915) the alfalfa acreage increased over 500 per cent, and it is very probable that a similar increase has occurred in many other States in the timothy belt.

Alfalfa yields from two to three times as much per acre per year as timothy; it is cut three or more times and timothy but once. Timothy harvest occurs during midsummer, when the temperature is high, and curing takes place rapidly, whereas the first and last cuttings of alfalfa occur at times when the temperature is low. This fact and the succulent nature of alfalfa make the latter much more difficult to cure than timothy. The alfalfa grower is therefore confronted with the problem of how to cure his hay.

He has two methods from which to choose, namely, curing by the method he has always used (i. e., in the swath or windrow), and curing in the cock under hay caps. If he decides to continue using the old method he should be prepared to stand, at least, the average leaf loss that occurs in good haying weather and to run the risk of the much greater loss of leaves and the lowering of feeding value that come with exposure to rain during unfavorable weather. If, however, he should decide that it is good farm practice to save as much of the crop as possible, since it is more nutritious feed than timothy, his former objections to curing in the cock, under hay caps, will not hold good, for alfalfa will stand more expense for labor than will timothy.

Moreover, when timothy-and-clover hay is replaced by alfalfa hay, the hay acreage necessary to produce the yearly tonnage required on the farm will be greatly reduced. This will make possible the use of a greater amount of labor for cocking and other operations without increasing the number of men required.

#### SPECIAL CONDITIONS IN THE SOUTH.

Hay growers in the South are of two classes, those who grow hay for use on the farm only, and those who make a business of growing hay for the market. The first class consists of farmers whose farms are almost entirely devoted to the growing of cotton. In sections where Johnson grass grows, very little attention is paid to the method of making hay. The hay is often produced on numerous small, irregular-shaped fields and along ditch banks. No particular attention is given to crew organization, time of mowing, raking, or hauling. All of the hands that can be spared from the cotton fields are used to get in the hay as easily and quickly as possible.

Those who make a specialty of producing market hay are familiar with the better methods of haymaking. The "swamp" or lowlands in the vicinity of Augusta, Ga., especially Beech Island, just east of Augusta, are almost entirely devoted to the production of market hay. Johnson grass hay is the principal kind grown. On some farms the first cutting contains some Bermuda and "Augusta" vetch.

The general practice in this section is to cure in cocks containing about 400 pounds of cured hay. Most of the hay growers use the push rake to haul the cocks to the barn or stack. Hay caps are not used. The best haymakers claim that a well-made cock of Johnson grass hay will turn rain fairly well and that, therefore, there is no need to use caps. The kind of cocks referred to are not made by rounding up a bunch of hay, as left by the push rake, but are built from the ground up, a forkful at a time, and carefully topped off and raked down with a pitchfork. Such a cock will shed more water than a bunch made with a push rake that has been simply rounded up a little. Comparatively little hay is baled from the cock, on account of the difficulty in curing it sufficiently.

Hay to be baled from the cock must be cured more thoroughly than hay in condition to be put into the stack or barn. The difference in water content, however, is comparatively small, perhaps not more than 10 per cent. If some means can be found for finishing the curing in the cock, then the expense of stacking or putting into the barn can be avoided. This end is accomplished by the use of hay caps. The cost of hay caps and of the labor of putting them on and taking them off will be considerably less than the cost of labor for stacking or putting into the barn. If hay caps are used and hay is baled from the cock, there will be little danger of the hay heating and spoiling, provided an air space of an inch or two is left between the bales when they are placed in the barn.

Throughout the "black" or alfalfa belt of the South many farmers are making a specialty of growing Johnson grass and alfalfa mixed hay for market. The general practice is to cure in the cock. Hay caps are not used very much and there is a general lack of definite knowledge of their value. Very little hay is stacked or put into the barn, the greater part lying in the cock until baled.

Rain causes considerable damage to this hay not only before it is cured but also after it is cured and is waiting to be baled from the cock. It sometimes happens that hay will be mowed, raked, bunched, cocked, and cured out ready to be baled without a rain occurring until baling is just about to begin. The rainy weather delays baling for a week or longer, and a serious loss is caused by discoloration. The use of the right kind of hay caps would prevent a large part of such loss.

Failure will result, however, if heavy canvas or wood-pulp caps are used on hay not sufficiently cured, or on hay wet with rain when cocked, and especially if the ground is saturated with water. The light-weight cap permits evaporation and at the same time affords sufficient protection from rain. The objection to the use of light-weight caps that they prevent moisture from escaping has been



proved to be erroneous by a number of successful haymakers in the South who use them and succeed in making hay of the best quality.

#### EXPENSE OF COCKING WITH UNSKILLED LABOR.

On farms in the North and East, devoted largely to the growing of hay, it is necessary to employ considerable extra day labor during the haying season. If the farm is adjacent to a city, this extra labor is sometimes done largely by men with little or no experience on a farm, who, consequently, know nothing about cocking.

On a large hay farm in New Jersey, where more than 600 acres of alfalfa is grown yearly, it was found that it took four unskilled laborers to do as much work per day as is usually done by three experienced men. Some transient laborers soon get to be good cockers, but many are totally uninterested in their work and have no ambition to build cocks that will stand in bad weather.

The quality of the extra labor available should always be taken into consideration by the hay grower when studying the practicability of curing in the cock under hay caps.<sup>1</sup>

#### EXPENSE OF HAND LOADING COCKED HAY.

One objection advanced against curing hay in the cock under hay caps is that hay loaders can not be used on cocked hay, and cocking necessitates pitching the hay on the wagon by hand, which is a much slower and more costly method of loading than with the hay loader. This objection is valid if it is assumed that the hay loader is necessary for economical haymaking. There are, however, methods of handling hay from the cock that are no more expensive than using the loader. The hand loading of cocked hay can be avoided by the use of the sweep rake,<sup>2</sup> which can be used to take the hay cocks directly to the barn on many farms in the East.

If it is not found convenient to use the push rake, and if the acreage is fairly large, it may be found economical to load the hay by means of the combination sweep and stacker, which picks up the hay cocks and drops them on a wagon driven alongside.

<sup>1</sup> The writer wishes to suggest a method by which unskilled farm labor might be used for cocking to better advantage than at present. It might prove worth while to try to teach laborers of this type not to build the ordinary tall, narrow cock, containing from 75 to 100 pounds of cured hay, but to build cocks containing from 200 to 300 pounds, which will be greater in diameter and require less skill in building than the tall narrow cocks. The only point to be watched, when building such cocks, is to see that the top is well rounded off so that when the cap (especially the light-weight cap) is put on there will be no depression to hold rain and allow it to soak into the cock. Unskilled laborers will handle a greater amount of hay per day in building the larger cocks than they will making small cocks which require close attention and skill in shaping. The cost of the caps required for cocks of this size will, of course, be more than for a smaller cock, but the cost of caps per cubic foot of hay protected decreases as the size of the cock increases.

<sup>2</sup> For information on the use of the sweep rake in the East, see Farmers' Bulletin 838, United States Department of Agriculture, "Harvesting Hay with the Sweep-rake."